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MAKING THE INFORMATION REVOLUTION ORGANIZATIONALLY FRIENDLY

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INTRODUCTION

Business and government organizations are beginning to feel the impact of the major breakthroughs in information technology. Available is a rich variety of reliable, cheap and "user friendly" hardware and software systems on new mainframes and micros, with potential applications ranging from mammoth accounting and manufacturing control systems to elegant executive and office work support systems. The technology promises benefits that are indeed revolutionary. To date, however, the business results from the new technology are falling short of such benefits.

From our observations, the problem is not with the technology per se. It is inadequate management of simultaneous technological and organizational change. To succeed with this new kind of change, managers need to rethink the conventional wisdom and broaden their approach to employing information technology. Enough experience with the new technology has now occurred to enable us to document such an approach, and to go beyond the common dictum that senior management "must be involved" in planning and implementing new systems.

The approach described in this article specifies when management involvement in change is appropriate and how to manage the change successfully.

The approach consists of conducting an assessment of the organizational risk of new technology, then taking action based on the degree of risk. When the risk is low to moderate, one of three viable change strategies ("traditional," "authoritative," or "evolutionary") may be engaged. These strategies are characterized by differences in the way technology development and organizational change are integrated, and by the degree and kind of involvement required of senior managers. When organizational risk is high, initial action may be required in the context itself, change that is a prerequisite to using one of the strategies.

We shall first describe the problem in more detail, then discuss the three strategies, the steps of the organizational risk assessment and finally the use of the assessment in selection of a strategy or for the change in context.

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PROBLEMS WITH OLD APPROACHES

In a recent study of twenty cases of new information systems, all with large potential business benefits, only four were found to be fully successful in achieving management expectations. The other sixteen systems were limping along or had been killed mercifully. Their symptoms included extensions of project deadlines, cost overruns, and passive and active end-user resistance. In one case, there was overt sabotage by clerical users. In several cases the new system was being run in parallel with the old. In every instance of failure, the root cause was a poor fit between the technological system and the organization, or job environment, of the would-be users. Typically, it was only late in the projects, when conversion was imminent, that the symptoms of impending failure became evident. Management was blindsided.

In more than half the cases we studied senior management (line managers two and three levels above the direct users of the system) attempted to deal with the implementation problems, but with efforts that were too late and too little. Their approaches were born of a concept of managing systems implementation that was grossly insufficient to the underlying problem. Efforts were made at better project management, including tighter project planning and controls, employment of experienced project managers, and increased personal attention by users and senior managers. There was no strong correlation of these efforts with project success, that is, achieving the intended ultimate business results. An intensification of known techniques did not address the need for a change in fundamental managerial thinking, for a new approach.

All of the organizations we studied had one preferred way to develop systems and implement them, and for most of them this was inadequate for the successful introduction of new systems.

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STRATEGIES FOR MANAGING ORGANIZATIONAL IMPACT

To manage the technologically-stimulated change, management needs in most organizations to expand their repertoire of available strategies for change. The three alternative strategies described below represent different ways to integrate simultaneously the development of new information systems with the changes in the organizational environment of users. Each strategy has a specific and distinct role for senior line management, that is, managers two to three levels above the users of the information systems.

The Traditional Strategy

As its name suggests, the traditional strategy is the most common in use today. In our research it was the strategy in over half of the twenty cases, but in none of the four successes.
Nevertheless, under low risk conditions it is appropriate and efficient.

The characteristics of the traditional strategy are the separation of the systems development activity from the management of any change in the user organization, and the low level of senior line management involvement. The relationship between the systems developers and user management is contractual and arms length. Indeed, the development work may be done by outside software development consultants, or the system purchased as a package or from a service bureau. For their part, user management is responsible for anticipating and bringing about any changes in jobs, skills, organization structure, work incentives, and the like which may be necessary for successful use of the system.

The traditional strategy requires little of senior management. Integration of the technical development effort and the organizational change effort, if any, is accomplished by documentation and project planning. The systems development process is driven by a methodology of predefined project phases. Typically, these are the feasibility study, the functional requirements, the system specifications, programming, testing, and final training and cutover. Project monitoring and control are handled by a budget and reporting system, itself often computerized, which deals with the measurable entities of dollars and time spent. More often than not, there is no corresponding methodology or control system for the change process that may have to go on in the user organization. About the only feature of user change that is on the checklist in the traditional strategy is training in individual usage, attention to "ergonomics" in the physical design of hardware, and efforts to make interactive systems user-friendly.

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While it suffers self evident faults as an overall approach for high impact technology, the traditional strategy has the advantage that many IS departments and software houses are well up on the learning curve - some after years of painful trial and error - in its use. Thus, under relatively benign conditions of organizational impact this strategy will be adequate and the most efficient for a successful implementation.

Unfortunately, the high impact systems of the information revolution rarely if ever are introduced under such conditions. The traditional strategy may be an appropriate PART of a project in which a highly complex system is built deliberately and for good reason in isolation of the ultimate users. This might be the case, for example, where a software firm builds a packaged system for accounting or inventory control, or a worldwide corporation develops a system for operations reporting which must provide common information and be common in its inherent structure and use. Nevertheless, the achievement of business results by the buyers of the package, or by the line managers in the branch offices responsible for implementing the common system, may still require organizational change so extensive as to offset the economies of an efficient technical development.

In short, the traditional strategy applies where the risks of failure lie in the realm of technical development rather than in organizational impact. Too often, it appears, this strategy is the one chosen out of force of organizational habit rather than selection, out of preference of the technicians and uninformed users rather than by senior management study of the organizational impact of the system.

Where new systems have high impact and revolutionary potential benefits for the organization, other strategies are necessary.

The Authoritative Strategy

In three of the four successful cases in our study (and in one third of the failures as well) line managers took direct responsibility for both the technical project and the organizational change. In these cases change was tops-down. Integration between technical and organizational change was close, and personally directed. One case was a classic prototype:

> The head of operations for a major commercial bank
> hand-picked the project team for the development and
> implementation of a new foreign exchange trading system.
> Before any organizational changes were introduced thorough
> and detailed plans were presented and reviewed by the
> operations head himself. Clerks and managers in the existing
> operation were consulted and interviewed for the purpose of
> system designers understanding functions, but not as
> participants in the change. Upon completion of the system,

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management announced staff reductions and named several members of the development team to line management positions in the new operation. Although initial breakin of the system revealed several unanticipated problems, there was quick recovery.

Where the traditional strategy features the separation of responsibilities for systems development and organizational change, the authoritative strategy focuses on the line user manager as integrator and instigator of change. The authoritative strategy has the great advantage that the line is thoroughly involved, as in the illustration above, with the result that the organization being changed does not distinguish between a technical change and any other type of change which management might initiate from above. Where forced reductions in staff are anticipated, the authoritative strategy may be the only viable approach.

The limitations of this strategy are the demands on management in terms of time and knowledge required. The authoritative strategy requires understanding the technology, at least to the level necessary to provide direction and to make critical calls during implementation. Another limitation is greater potential for resistance to change. The tops-down approach must involve careful contingency planning, a heavy investment at the time of implementation, an anticipation of blowups, and a forcefulness to see the project through despite setbacks.

The Evolutionary Strategy

Also in contrast to the traditional strategy, and in common with the authoritative strategy in the tight integration of systems development and management of organizational change in the user work environment, is the evolutionary strategy. Here, however, the process of change is "bottoms up." The users participate heavily in development and in decisions on organizational changes. Another of the successful cases from our study illustrates the approach:

> A middle manager in charge of back office item processing operations for an Edge Act subsidiary of a commercial bank initiated a series of new systems changes with the tacit approval of senior management. The process was heavily participative. Work teams of clerical employees made decisions on new systems and changes in work methods, organizational relationships and job descriptions. The manager was described by his boss as "charismatic." In addition to loyalty and admiration, he held respect. He set clear goals and insisted that they be met. He also made key decisions, such as the technology architecture, after thorough consultation. Much time was spent in group meetings, but a sense of ownership by all employees resulted in a new and more efficient automated operation. After four years and several subsequent projects the manager was in

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charge of all operations. Over this period no one was cut from the staff, but productivity was higher than most competitors by virtue of cost avoidance - making the work of existing employees more efficient so that new staff were not added as volume increased.

The evolutionary approach makes use of teams and consensus decision-making by the users, who operate within a framework of goals and technology constraints set by senior management. The work of proponents of the "sociotechnical" school, in which work environments are conceived as human and technical systems, fits within this strategy. There appears to be growing interest in using the evolutionary strategy, particularly in organizations with cultures of participation. Moreover, tools and techniques are available now to enable participative and end-user development that were not around even three years ago. These include the microprocessor technology of the 1980's, new fourth generation software, and methodologies for prototyping even large transaction processing systems.

There is no assurance that an evolutionary strategy will work in all situations. The management role here is subtle and no less difficult than in other strategies. Management must have a vision of the long range goals, an ability to communicate this while still leaving the means to the ultimate users. The process of evolution is a learning process, involving trial and error and scrapping of pieces of the system as it is developed. When this strategy is successful, gradual change of the job environment occurs, concurrently with the advent of new technology.

Given the fundamental differences among these three strategies, the choice of one must be carefully done.

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SELECTING A STRATEGY: THE ORGANIZATIONAL RISK ASSESSMENT

An "organizational risk assessment" study should be conducted at the beginning of every project or program involving new information technology. To carry out the assessment, management must know the overall business results being aimed for, and have some understanding of the technology application. The assessment provides a structured guide to examining the conditions that together determine risk. The strategy for change appropriate to the level of risk may then be chosen.

The organizational risk assessment consists of finding answers to three questions pertaining to a particular project or program:

      1. Is senior management ready with the knowledge, commitment and potential involvement to make this change succeed?

      2. What is the required pace of system development and change?

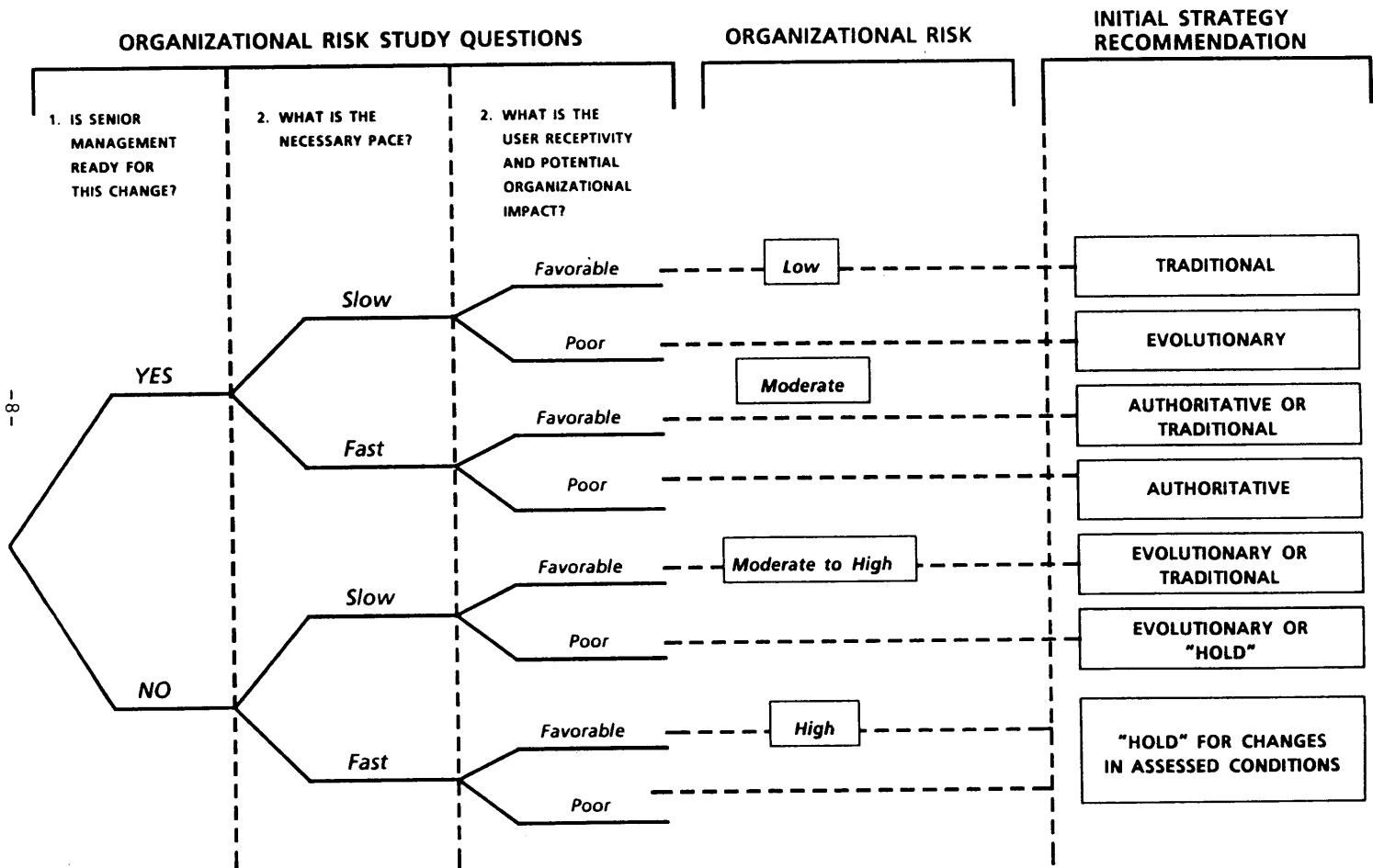   3. How receptive are the potential users, and how much change in their job environment is implied?

For some projects the assessment may take the form of one or two managers discussing the questions and deciding where their organization comes out. For most major projects, and for broad programs of change, the assessment represents an effort requiring more extensive study. Exhibit 1 illustrates how basic binary answers to each of the three questions may be arranged to determine the degree of risk and to select the appropriate normative strategy. Typical subquestions for assessments are discussed below:

Is Senior Management Ready?

We believe the presence of an appropriate level of commitment and involvement by user management is the most important single factor in determining the degree of organizational risk. This first broad assessment question asks how adequate is senior management knowledge and capability to manage change relative to what will be required in the circumstance. While many applications of technology require little from senior management, an increasing number require more than is frequently realized. Thus, the automation of existing accounting functions, with no anticipation of organizational changes, even if it represents significant cost and technological risk, may have adequate senior management readiness because little should be asked of them. On the other hand, a program to hold or reduce the costs of white collar staff, calling for significant injections of technology and the redesign of support functions to capitalize on the technology, may demand of senior management unprecedented levels of understanding of technology, use of technology, and time and perseverance to manage change.

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EXHIBIT I

ORGANIZATIONAL RISK AND CHANGE STRATEGY

ORGANIZATIONAL RISK STUDY QUESTIONS			ORGANIZATIONAL RISK	INITIAL STRATEGY RECOMMENDATION
1. IS SENIOR MANAGEMENT READY FOR THIS CHANGE?	2. WHAT IS THE NECESSARY PACE?	2. WHAT IS THE USER RECEPTIVITY AND POTENTIAL ORGANIZATIONAL IMPACT?		

YES

- Slow
  - Favorable — Low — TRADITIONAL
  - Poor — EVOLUTIONARY
- Fast — Moderate
  - Favorable — AUTHORITATIVE OR TRADITIONAL
  - Poor — AUTHORITATIVE

NO

- Slow
  - Favorable — Moderate to High — EVOLUTIONARY OR TRADITIONAL
  - Poor — EVOLUTIONARY OR "HOLD"
- Fast
  - Favorable — High — "HOLD" FOR CHANGES IN ASSESSED CONDITIONS
  - Poor

A specific question here is to determine how clear to management are the business goals of the project. They should be crystal clear. At the same time, management may be and probably should be flexible as to the means and locus of responsibility required to achieve those goals. This enables consideration of alternative strategies. Another area for assessment is management computer literacy and comfort in managing technology. What has been the career experience in using or implementing information technology? Does the experience apply to what appears to be coming in this project or program? How conscious is the management that their level of capability in this regard is suitable or unsuitable? How amenable are they to potential training if they need it? Finally, to what degree is management prepared to be involved, i.e., how much time they can spend, if such high involvement strategies as authoritative or evolutionary should turn out to be appropriate?

We find an increasing number of managers ready to commit to change involving technology. Moreover, many are comfortable carrying out organizational changes. What is still missing is the experience or knowledge of how the technology will effect the organization.

Assessing management readiness requires judgement of capability to steer on uncharted seas. The real purpose of the entire organizational risk assessment itself is to provide management with the framework for thinking and discussing what they have to do and how to do it.

What is the Required Pace?

The second assessment question is straightforward. The pace of a project, like the intended business results, is a given for assessment purposes. Like management readiness, pace should be judged relative to the organization's experience in managing change in the past. Rapid change may be hectic and stressing for some, leisurely for others.

What is the Potential User Impact?

The third part of the organizational risk assessment has two subparts: a judgment of the receptivity or perspective of potential users toward the technology, and an analysis of potential changes in the job environment of the users.

Assessment of user receptivity requires asking specific questions of individual users about their attitude toward technology in general and the anticipated project or program in particular. Receptivity must be judged both from direct evidence and indirectly, by inference, from interviews with users. While much can be learned from answers to direct questions, such as, "What would you say is the receptivity here to the potential use of computers in the department?," some of the most important conclusions about potential user reaction are more likely to come from indirect and subjective data. For example, a prevailing

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presumption is that older employees are less receptive to new systems. We find that this is reported by many interviewees, even about themselves, but as often as not it turns out not to be true. The individual who states this may be expressing the prevailing myth. The interviewer should assess receptivity not only from direct answers, but also from evidence as to how the individual reacts to and has reacted to other kinds of changes in the job, and how well he or she appears to respond to professional or organizational incentives, peer and cultural pressures, and the like.

The second part of the user assessment looks at the characteristics of the jobs as they are before and as they will have to be after the introduction of the technology. There are five such characteristics, outlined here with specific assessment questions for each:

1. The Role of the Boss. Will the immediate superior of the users have to change his or her skills or style? Will the successful use of the system subvert authority? Are the supervisors capable of carrying out their role in an authoritative or evolutionary strategy, if either of those should prove appropriate?

2. The Organization Structure. Is a restructing of the user organization necessary to achieve the benefits of the program or project? What restructuring of the Information Services organization is called for? Is the timing of new technology with structural change realistic?

3. Jobs and Workflow. Is it possible to specify precisely the nature and extent of individual job changes? If so, how great are these changes? (It may be difficult to be precise here. While many technology applications, like new "Materials Requirements Planning" or word processing are relatively predictable in terms of the jobs of users, others, such as executive support systems, are less predictable.) What new recruitment or retraining is necessary, and how long will it take relative to the time available?

4. Policies, Procedures and Incentives. What changes if any need to be made in the compensation structure and levels? Can such changes encourage the use of the technology? Will formal policies defining limits on and controlling individual initiative need to be stronger or weaker? If the quality required of data for the new situation is higher, will new procedures have to be developed to insure and check the quality levels?

5. The User Culture and Psychological Contract. Are the formal rules and relationships in the user organization supportive of the technological and organizational

changes? Are the professional or union relationships supportive? Do individual expectations of equity and the scope of what is perceived as appropriate commodities in the implicit relationship between employee and employer here have to be changed?

The Risk Outcomes

One organization with which we are familiar has developed a standard assessment questionnaire for use at the front end of each new information system project. Answers to the questionnaire are scored, weighted, and summed to give an overall organizational risk level for the project. Such quantitative aggregation can be useful, but for major new systems the process should not be routinized. The key criterion for conducting the assessment is that it provide input useful to management deliberation of risk. Risk may range from low to very high, and management involvement in selecting a strategy and in carrying it out should be directly proportional to the level of risk.

USING THE RISK ASSESSMENT TO DETERMINE MANAGEMENT ACTION

Programs and projects that carry low or moderate organizational risk can be undertaken using one of the three strategies described earlier in this article. In the paragraphs that follow we shall first illustrate these situations and discuss the significance of considering a variety of potential strategies, rather than just one. Then we shall treat the situation of high organizational risk. In that case a different kind of management action may be necessary even before one of the three change strategies can be employed. High organizational risk suggests that the context of conditions assessed should itself be changed.

Low Organizational Risk

Under conditions of low risk most organizations should manage change with the "traditional" strategy, sealing the technological development (or purchase) into a project separated from the eventual users, with formal specifications and contractual relationships between users and developers. In such projects, as we have defined them, it would be an inappropriate use of line management time to be "involved" or "responsible" for the technological development, or to be concerned with impending organizational change where little change is anticipated.

Systems projects with low organizational risk may nevertheless have great importance and business benefit. Examples include virtually all the technical projects required to increase the efficiency of the technological infrastructure, such as changes in mainframe hardware and software, development of telecommunications networks, major maintenance to existing applications software. Of course, such projects may have significant impact on the information services organization, and may call for carefully managed change in the jobs and skills of data processing professionals. Nevertheless, user organizational risk, the focus of attention here, is typically low in these IS projects. Senior line management may take greater than passing interest in them, either because the investment is high or there is technical risk of disruption to existing computer-based services. The nature of that concern should generally be analogous to a customer dealing with a contractor: the technical project is justified in business terms but conducted by a contractor for a buyer.

In addition to these high technology-intensive, low user-impact projects, a number of new systems which will have direct user impact may also have low organizational risk. Examples include introducing "decision support" tools or the use of personal computers by individuals for their own job purposes. Here the requesting user is not immediately to be tied to others' jobs in a "workstation" or network. While such projects may be part of a

long-range program that will have high organizational risk, a
traditional strategy will most often be the most efficient way of
getting these initial steps done. The individual user will be
heavily involved in the use of the technology, but assessments we
are familiar with suggest it is a kind of involvement that can be
attained by good functional analysis, user friendly system design,
and training by the developer and introducer. These types of
systems have the characteristic that the users' perspectives
toward their jobs is such that the system has a self-incentive to
induce commitment and involvement toward the end of full
utilization.

These conclusions for low organizational risk systems suggest that
the traditional strategy is for from passe. Organizations looking
ahead to some moderate and high organizational risk programs for
new technology should think twice before investing in high
management-intensive strategies (authoritative or evolutionary)
for all projects. Attempting to shift from the traditional
approach to these more demanding strategies for all their new
systems development projects is, in our view, as potentially
wasteful as sticking to the traditional approach when it is
inadequate.

Moderate Organizational Risk

Compared to continuing opportunities of low organizational risk
projects, significant business benefits from information
technology will increasingly call for projects with greater
organizational risk. For most organizations, success at moderate
risk projects requires a shift from the traditional strategy to
either of the two strategies requiring intensive management
involvement: authoritative and evolutionary. As described
earlier, most of the failed projects in our study of twenty
resulted from the inappropriate application of a traditional
strategy to moderate and high organizational risk situations. The
successes came more often than not as anomolies.

An authoritative or an evolutionary strategy can run counter to
the prevailing culture of the organizations. In organizations
with a heavy reliance on tops-down or authoritative change, an
assessmemt calling for evolutionary change raises the question of
how to conduct such counter-cultural change. In one successful
case, this was accomplished by a kind of isolation of the project,
a buffering of the user department from the rest of the
organization for a temporary period to enable heavy participative
involvement by users. In another situation, management is
considering a change in the culture itself, from generally
authoritative to participative. Their reasoning is that end-user
developed technology and evolutionary change is a preferred future
state. Thus, technology aimed at significant business benefit is
also being conceived as the instrument of cultural change itself.

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High Organizational Risk

When an assessment suggests that the conditions of management readiness, necessary pace and user receptivity and impact are all unfavorable, it is likely that no one of the three viable change strategies will succeed. Action here should be directed at changing those conditions themselves, that is, the organizational context.

Such a situation is illustrated by the case of a government agency which conducted an organizational risk assessment study in advance of a major program for automation for operations and for improving line management information. The work of the agency is uniform throughout its network of regional offices. Great efficiencies are to be obtained from automation, particularly since common systems can be developed and applied to all offices uniformly. The prevailing organizational culture is paternalistic, verging on authoritarian. The strategy for any new information system is gothic traditional.

The assessment found that field management was not ready to carry out the change successfully, commitments had been made to proceed at a fast pace, and user receptivity and impact were poor. This added up to unquestionable high risk. A first analysis by management gave consideration to slowing the pace of the program, which would put the program on a viable path toward evolutionary change. This, however, would run counter to the authoritative culture. While the program of technology will eventually revolutionize the way the agency does its business, there is no sense yet that trying to change the culture to fit the prescribed strategy is worth the effort in the short run. Rather, change is being contemplated which will achieve a path to a moderate level of risk and a viable strategy that is consistent with the prevailing culture. Under consideration is a crash program of management education in computer literacy and technical and organizational change management, plus a plan to expand the skills of the information services' systems development function to enable closer integration with line management during the development process.

This difficult case of change in context is unfinished. Awareness of the need for such fundamental change is not widespread among middle level managers in the agency. It remains to be seen whether a change in management thinking and overall approach can occur even as systems development proceeds, using traditional techniques on a high-risk path. The success of the program may hinge on whether change in management "readiness" can be achieved in time for those line managers to accept the responsiblity for the authoritative strategy. Whatever the result of this, by virtue of the organizational risk assessment study management of the agency now has available to it a set of ideas and a guide to provide a template and vocabulary for discussion, decision-making and action.

CONCLUSION

It is quite clear that the technological revolution is continuing apace, and that technology will offer opportunities for business benefits that can only be achieved by somehow managing the organizational risks proportional to those potential benefits. Thus, the promise will grow of breakthroughs in productivity in manufacturing through robotics and materials management systems, productivity in the office through applications of office automation, effectiveness in executive decision making through "executive support systems", and in new products, services and markets. Hardware and software vendors put top priority on making these applications of technology "user friendly". Our concern has been the need for systems which make for an organizational fit. Unless new ways are found to master the introduction of change to achieve a fit of technology and recipient organization, the frustrations and costs will grow.

To address this need, we have suggested two levels of change. The first is to include three alternative change strategies, and to conduct an organizational impact assessment to select the appropriate strategy. The second level, more fundamental in nature, is to change the basic conditions revealed by the impact assessment. In particular, these include the condition of managerial readiness and capability for conducting simultaneous technology development and organizational change.